

Gas Law Problems #1

*Use Charles', Boyles, Combined Gas Law to solve the following **problems on a separate sheet of paper.** **All work must be shown to receive credit:***

$$760\text{mmHg} = 760\text{torr} = 101.325\text{ kPa} = 1\text{ atm} = 14.7\text{ psi}$$

$$\text{STP} = 273\text{K and } 1\text{atm} \quad \text{K} = 273 + ^\circ\text{C}$$

Boyle's Law Problems, $P_1V_1 = P_2V_2$

1. If a gas at 25.0°C occupies 3.60 liters at a pressure of 1.00 atm, what will be its volume at a pressure of 2.50 atm?
1.44 L
2. A gas occupies 1.56 L at 1.00 atm. What will be the volume of this gas if the pressure becomes 3.00 atm?
0.520 L
3. A gas occupies 11.2 liters at 0.860 atm. What is the pressure if the volume becomes 15.0 L?
0.642 atm
4. A gas occupies 4.31 liters at a pressure of 0.755 atm. Determine the volume if the pressure is increased to 1.25 atm.
2.60L
5. 635 mL of a gas is at a pressure of 8.00 atm. What is the volume of the gas at STP?
5080 mL

Boyle's Law problems with pressure conversions

6. Chlorine gas occupies a volume of 1.2 liters at 720 torr pressure. What volume will it occupy at 1.0 atm pressure?
1.1 L
7. Fluorine gas exerts a pressure of 200 kPa. When the pressure is changed to 1.50 atm, its volume is 250 mL. What was the original volume?
190 mL
8. A sample of gas has a volume of 12.0 L and a pressure of 1.00 atm. If the pressure of gas is increased to 1000 mm Hg, what is the new volume of the gas?
9.12 L
9. A container of oxygen has a volume of 30.0 mL and a pressure of 500,000 Pa. If the pressure of the oxygen gas is reduced to 28 psi and the temperature is kept constant, what is the new volume of the oxygen gas?
77.7 mL
10. Ammonia gas occupies a volume of 450. mL at a pressure of 720. atm. What volume will it occupy at standard pressure (STP)?
324,000 mL
11. A 40.0 L tank of ammonia has a pressure of 1000 mmHg. Calculate the volume of the ammonia if its pressure is changed to 500 torr while its temperature remains constant.
80.0L

Charles's Law Problems, $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ Convert all temperatures to K, $\text{K} = 273 + ^\circ\text{C}$

12. 4.40 L of a gas is collected at 50.0°C . What will be its volume upon cooling to 25.0°C ?
 - a. Solve for V_2 keeping all temperatures in $^\circ\text{C}$.
2.2L
 - b. Solve for V_2 converting all temperatures to K.
3.99L

13. A gas sample at 40.0°C occupies a volume of 2.32 L. If the temperature is raised to 75.0°C, what will the volume be, assuming the pressure remains constant?

2.58L

14. A gas at 89°C occupies a volume of 0.67 L. At what Celsius temperature will the volume increase to 1.12 L?

332°C

15. The Celsius temperature of a 3.00-L sample of gas is lowered from 80.0°C to 30.0°C. What will be the resulting volume of this gas?

2.58L

16. What is the volume of the air in a balloon that occupies 0.620 L at 25°C if the temperature is lowered to 0.00°C?

0.568L

17. Calculate the decrease in temperature when 2.00 L at 20.0 °C is compressed to 1.00 L.

147K

18. 600.0mL of air is at 20.0 °C. What is the volume at 60.0 °C?

681.9mL

19. A gas occupies 900.0mL at a temperature of 27.0 °C. What is the volume at 132.0 °C?

1215mL

20. What change in volume results if 60.0mL of gas is cooled from 33.0 °C to 5.00 °C?

54.5mL

21. Given 300.0mL of a gas at 17.0 °C. What is its volume at 10.0 °C?

292.8mL

Combined. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ **Convert all temperatures to K, K = 273 + °C**

22. The pressure of a gas changes from 120 kPa to 50 kPa. The volume changes from 45 L to 40 L. If the initial temperature is 81°C, what is the final temperature in °C?

-142°C

23. A sample of nitrogen goes from 21 m³ to 14 m³ and its pressure increases from 100 kPa to 150 kPa. The final temperature is 300 K. What was the initial temperature in Kelvins?

300 K

24. A sample of argon goes from 500 K to 350 K and its pressure changes from 280 kPa to 380 kPa. If the initial volume is 18 dm³, what is the final volume?

9.3 dm³

25. A sample of neon experiences a pressure drop from 75 kPa to 53 kPa. The temperature increases from 27°C to 93°C. If the initial volume is 12 L, what is the final volume?

15.1 L

26. The volume of a sample of helium increases from 5 L to 25 L and its temperature drops from 2000 K to 1750 K. If the initial pressure is 1500 mm Hg, what is the final pressure?

262.5mmHg

27. The temperature of a gas increases from 212°C to 380°C. The volume goes from 30 dm³ to 18 dm³. If the final pressure is 1.85 atm, what was the initial pressure?

0.82 atm